

PROPANE and PROPANE FIRES

Objectives

- 1. Provide the ff with information on the characteristics and hazards of propane.
- 2. Provide the ff with methods and procedures on handling flammable gasses whether involved in fire or not.
- 3. Provide the ff with an opportunity to utilize control methods on flammable gasses.

Propane Characteristics

- Liquefied petroleum gas -mainly propane and butane
- Liquid boils at very low temp (-43* F)
- Colorless/odorless (Odorized by ethyl mercaptan)
- Category: flammable gas
- Heavier than air – stays close to the ground and travel along the contours of the terrain

704 Diamond

- Health (blue) -1
- Flammability (red) -4
- Reactivity (yellow) -0

Propane Characteristics

- 1 gallon of liquid expands to 270 gallons of vapor (liquid leak worse than gas leak)
- Can quickly migrate a great distance
- A liquid leak is much more dangerous than a vapor leak
- Will combine with air to form an explosive mixture
- A vapor cloud can reach an ignition source that will cause it to ignite and flashback to its origin

Propane Characteristics

- Forms a visible vapor cloud, serves as a warning to ff
- Helps track the direction of its travel
- May not reflect the extent of the actual flammable area
- This area may extend out a great distance
- Liquefied to increase the efficiency of transport and storage

Propane Containers

- Range from 1 pound to 120,000 gallons
- Motor transport-as much as 10,000 gallons
- Rail cars up to 20,000 gallons
- Rail cars are thermally protected, most other containers are not

Propane Emergencies

- LPG emergencies can occur when
 - Valves or fittings break
 - When containers are damaged or overfilled
 - When containers are affected by fire or radiant heat

Assessment of Leak

- Identify product
- Explosive potential
- Missile effects
- Fireball
- Ground flash
- Blast wave
- Protection of ff
- Fire control
- Area of evacuation

Explosion Potential

- The explosion potential of a container of LPG involved in fire becomes an explosion reality in 10-15 minutes
- Referred to as BLEVE's-boiling liquid expanding vapor explosion
- The explosion is brought on when fire impinges on a tank shell above the liquid level causing the metal to lose strength

BLEVE

- The increase in metal temp is fast as the vapor does not absorb heat as well as the liquid
- The tank will rupture from gas pressure inside the tank and releases the liquefied gas in one huge mass
- A large volume of liquid is converted to a larger volume of vapor

BLEVE

- This often results in a missile or rocket effect which propels the tank or its parts long distances
- Escaping gas can be ignited, a fireball occurs and with it, heat radiation and blast wave
- Mass evacuation of the area is a must

Response

- Rule of thumb is not to extinguish an LPG fire unless the fuel supply is shut off
- Cooling of the shell, especially the vapor space area and the point of flame impingement is very important
- Cooling will reduce escape of vapor

Pre Fire Plan

- Pre fire plan is very important due to the fact that there are not very many LPG emergencies
- This leads to a tendency to overlook or ignore the problem
- History shows positive outcomes come from using strategies and tactics based on pre fire plans that ff were well trained on

Hazards when not Involved in Fire

- Inhaled (vapor)
 - Dizziness
 - Difficulty breathing
 - Possible loss of consciousness
 - Easy ignition from an ignition source
 - Heavier than air-flows down hill
 - Can flash back to leak

Hazards when not Involved in Fire

- Liquid
 - Can cause frostbite
 - Floats and boils on water (forms a vapor)
 - Flammable visible vapor cloud is produced
 - Boils at -43.8° F
 - Liquid can pool

Hazards when Involved with Fire

- Containers may explode-BLEVE
- Flash back along vapor trail may occur
- Vapor may explode if ignited in an enclosed area
- Burns with a loud pressurized flame

Hazards when Involved with Fire

- Flame
 - Burns yellow orange or blue
 - Can be invisible when approaching behind a water curtain
 - Extremely hot
 - Will cause major burns if not protected
 - Flame usually stays at leak source
 - Radiant heat can be deceptive

Gas Fire Involving a Vessel

- Use full PPE
- Listen for an increase in noise level
- Place copious amounts of water on vessel
- Have a plan
- Work upwind if possible
- Limit the number of exposed personnel-
use unmanned master streams

Identifying a Potential BLEVE

- Sealed pressure vessel with direct flame impingement on vapor space
 - Increase in noise level
 - Increase in size of fire plume at relief valve
 - Tank color changes
 - Failure or expansion of tank shell

Dealing with a Potential BLEVE

- 1000 gallon tank or more
 - Copious amounts of water at flame impingement (500 GPM)
 - Evacuate area 5000 foot radius if flame impingement for more than 5 minutes (BLEVE is imminent)
 - Unmanned monitors

LPG Fires

- Team work
- Different from class A or structure fires
- Burn much hotter
- Increase in size and intensity very quickly
- Slippery and dynamic

Hose Teams (safety)

- Hose teams are used to cool exposures and as a safety line
- 3 or more ff per line, stand on same side of line
 - (different names than LFR uses)

Attack Team

- Used to attack the fire for purposes of cooling, controlling or extinguishment and/or to isolate valves to shut off product flow
- An attack team is a hose team with an additional team leader

Team Leader

- Number one priority is safety for the team
- Cool, control, isolate and extinguish fire
- Give clear, concise, loud commands
- Control all team movements
- This team leader will position themselves on the inside of the hose lines even with the ff on the nozzle

Nozzle Person

- Moves the nozzle as directed by the team leader
- Duties include:
 - Maintaining the required nozzle position
 - Making pattern and nozzle placement changes as directed
 - Remain alert to changes in the fire situation
 - Follow directions as given by team leader

Support Person

- Primary job is to provide 80% to 90% of the support needed to counteract nozzle reaction
- Provide enough support so the nozzle person does not have to support the hose at all
 - Nozzle person can concentrate on nozzle placement and adjustment

Support Person Con't.

- Positioned one arms length behind the nozzle person, same side of the hose
- Feet shoulder width apart
 - Makes it easier to handle the hose
 - Eliminates foot contact with ff in front and behind

Kinker

- Responsible to prevent interruption of the water supply
- Helps support hose
- Insures smooth movement of hose line during attack and backing out
- Position 15' behind support person

Kinker Con't.

- Kinker allows about 5' of hose to drag on the ground to help support the hose line thrust
- Watches for kinks in front and behind
- Aids in smooth hose movement while backing out

Moving Forward

- Essential that all members move in unison
- Commands
 - “prepare to advance” (do not move till command given)
 - “step” (move forward in unison, advancing with the lead foot, sliding it to keep both feet in contact with the ground, move trailing foot forward even with lead foot) (shuffle step)
 - Backward and side movements are the same (“prepare to step left”)

Shut Gas Off

- As you advance, stream needs to go from straight (cooling tank) to fog (protect ff)
- Push flames away from the valve
- Do not reach through fog pattern to shut off valve
- Hold nozzles steady
- Turn handle clockwise

Backing Out

- “Prepare to back out” (get prepared but don’t move yet)
- Nozzle person changes the stream from full fog towards straight stream (as they back out), and the kinker changes position on the hose line
- All members step backwards when command “step” is given

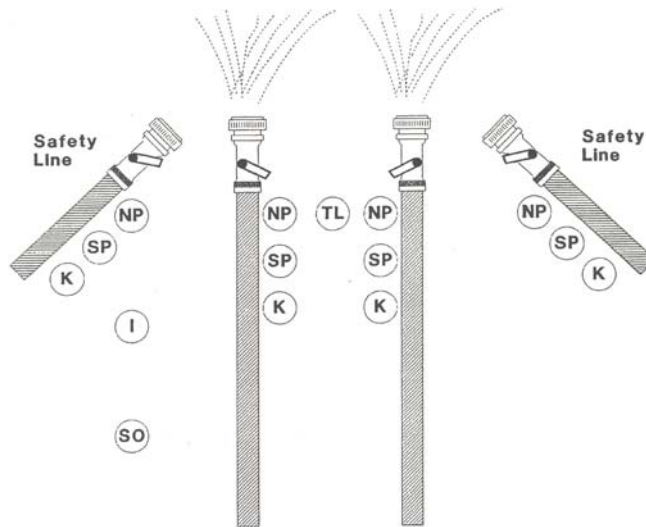
Safety

- Safety is the number one priority
- Fog absorbs more heat than a straight stream
- Communicate
- Correct nozzle position improves margin of safety
- Shuffle step helps prevent slipping and falling, helps maintain hose line control

Safety con't.

- Plan your attack carefully
- Don't let fire come under fog (make sure fog stays on the ground)
- Decide which foot is lead and which is trailer
- NEVER REACH THROUGH A FOG PATTERN!!!

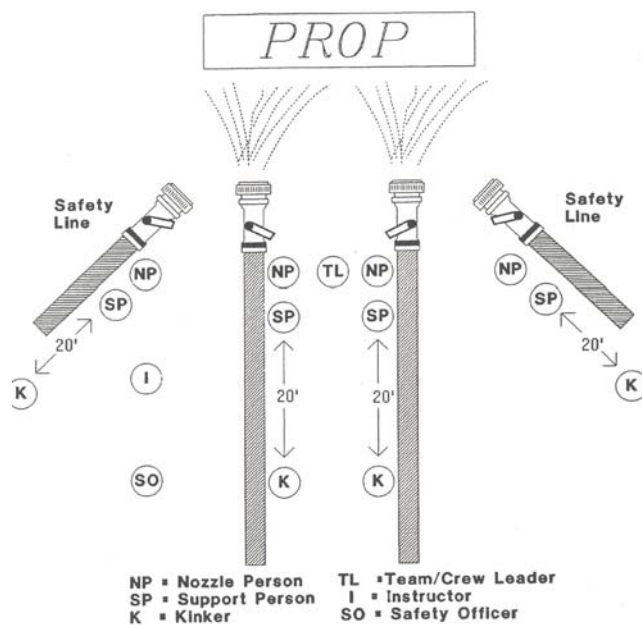
PROP



NP = Nozzle Person TL = Team/Crew Leader
SP = Support Person I = Instructor
K = Kinker SO = Safety Officer

Backout Overview

(Recommended Staffing)



Propane and Propane Fires

- Name _____
- Date _____ ID _____
- Rig/Shift _____
- Captains signature _____

1. The firefighter demonstrates ksa's in propane and propane fires. _____
2. The ff demonstrates ksa's in handling flammable gasses when not on fire.

3. The ff demonstrates ksa's in handling flammable gasses on fire. _____
4. FF demonstrates ksa's in control methods of propane fires. _____